Transmission Feasibility Study
For the
Integration of Libby Units 6 and 7,
Mitigation of Libby and Hungry Horse Generator Dropping, and
Elimination of the Libby and Hungry Horse Generation Cap

This report does not contain Critical Energy Infrastructure Information (CEII) as defined in FERC Order 630-A. The original technical report which describes specific line outages is retained at BPA for documentation and was modified to create this report.

1.0 Introduction

The transmission system in Western Montana was designed to integrate Federal generation based on river operations from decades ago as well as to serve local load including the smelter at Columbia Falls. When Libby was built in 1975 existing lines were looped into the new station. Essentially no new lines were added. In the last decade hydro operations have changed significantly, reliability criteria are applied more stringently, Avista loads in the Lewiston area have increased and Columbia Falls operation has been curtailed. Grid operations evolved to maintain reliability and cost-effectively respond to the changes, including generation shedding for certain transmission system conditions.

The preliminary analysis contained herein considered only modifications to the BPA system to address feasible solutions for additional capacity. Potentially, transmission options involving both the BPA and Avista systems could be developed and should be considered in future studies if a formal transmission request is made.

The 2000 Biological Opinion included a spill test at Libby dam to determine if the Libby Project could be operated at high outflows without violating water standards (dissolved gasses). The purpose of the increased outflows is to induce spawning of White Sturgeon in the Kootenay River below Libby Dam. Following the spill test, BPA Environment Fish & Wildlife (EF&W) requested a transmission study of the next level of mitigation — addition of the 6th unit. This feasibility study is in response to that request and will:

1. *Assess the impact on the existing system (system in late 2006) of the proposed 6th generator addition at Libby Dam and determine the transmission system reinforcements that are required to integrate the 6th unit (section 3.1).* Subsequent to presentation of the results for this request on Oct 16, 2003 to the Joint Operating Committee, BPAT was asked to: *Assess the system requirement to integrate two additional turbines at Libby (units 6 and 7) allowing an equal reduction of Hungry Horse generation (section 3.2).*

In addition, the study will also:

2. *Determine the cost and feasibility of reinforcing the system so that changes in Hungry Horse generation are not required to maintain the transmission stability of the Flathead Valley (section 3.3), and*

3. *Determine the cost and feasibility of reinforcing the transmission system so that changes in Libby generation (generator dropping) are not required to maintain voltage and transmission stability in the area (section 3.3).*

4. *Determine the cost and feasibility of removing the combined summer generation limit of 900 MW at Hungry Horse and Libby so the full 1025 MW generation could be utilized to meet Montana State water quality standards. This is in response to the Oct 16,2003 letter request to BPA Transmission (BPAT) from the US Bureau of Reclamation (section 3.4).*

A solution summary for the requests is shown on Table 1, report section 4.

2.0 Study Assumptions

The time period assumed for these studies is immediately after the completion of the BPA Grand Coulee-Bell Transmission Project and the Avista system reinforcements in late 2006. This joint BPA/Avista Project will add capacity on the West of Hatwai (WOH) cutplane and improve Avista load service. In addition to the Grand Coulee-Bell 500 kV line, BPA will also add series capacitors on the 500 kV system at Bell and Dworshak to improve the performance of the 230 kV and 500 kV systems between Montana and the Spokane area.

The remaining key assumptions and system conditions, which govern the study results in section 3.1, 3.2 and 3.4, are:

- West of Hatwai (WOH) flows are at maximum, approximately 4200 MW.
- Light summer, off peak load conditions
- Columbia Falls Aluminum smelter not operating
- High generation on the Western Montana Hydro (WMH: Libby, Hungry Horse, Noxon and Cabinet Gorge), approximately 1679 MW total with 944 MW combined generation at Libby (5 units) and Hungry Horse (4 units)(section 3.4 assumes 1025 MW generation combined at Libby and Hungry Horse)
- Six units at Libby generating 120 MW each (6 units in section 3.1, 7 units in section 3.2, otherwise 5 units at 120 MW)

3.0 Study results and analysis

The following section addresses the first request *"Assess the impact on the existing system (system in late 2006) of the proposed 6th generator addition at Libby Dam and determine the transmission system reinforcements that are required to integrate the 6th unit."* The year 2006 was chosen because the Grand Coulee-Bell 500 kV Project and planned Avista facilities will be completed. Please note that the present combined Libby and Hungry Horse generation limit is 950 MW in the winter and 900 MW in the summer. This study assumed the limit could be raised to at least 944 MW in the summer due to the system reinforcements represented in the study (Grand Coulee-Bell Project completed).

3.1 Base condition with 6 units at Libby

Thermal analysis

With the Libby 6th unit operating under the conditions above and no system outages, the Columbia Falls-Flathead 230 kV line and the Libby-Noxon 230 kV line are at 99% of their thermal rating. The Libby-Bonners Ferry 115 kV line is at 96% of its thermal rating. This case results in a near perfect balance of power flow in the area where all major lines are within 1 to 4 % of overloading. Any change in flow from Montana or a change in load level will cause one or more of the lines above to overload without an outage. Without additional transmission reinforcement, transmission curtailments may still be required when hydro resources are peaking. The frequency of curtailments will depend on simultaneous use of the system at the time.

Reactive analysis

With the 6th unit added at Libby, system losses increase by 27 MW and 254 MVAR. The high level of additional reactive losses (reactive losses increase in magnitude by more than twice the 120 MW of added real power) indicates a very stressed transmission system. Without the addition of new transmission or reactive sources (beyond the reactive supplied by the 6th unit), system reactive margins will decrease. Voltage control of the system in the area may be problematic and again will be dependant on the simultaneous use of the system. Although a more thorough reactive analysis was not completed, it is apparent that additional generator dropping (GD) will be required for some outages and there will be new outages that will require GD. This will result in much more frequent GD at Libby and possibly at Hungry Horse.

3.1.1 Outage Analysis with 6 units at Libby

The following outages were found to require GD at Libby (varies for each outage) to reduce the flow of power on facilities to within their capability. These outages do not currently require GD on the existing system. (Modified for CEII)

- One 115 kV line outage
- Four 230 kV line outages
- Two 230 kV bus outages
- Two double contingency 230 kV line outages

Additional GD at Libby (4 units instead of 3) is required for an outage of: (Modified for CEII)

- Two 230 kV line outages

The following line upgrades or reconductoring would mitigate thermal line overloads for a wider range of system operation and eliminate the additional GD requirements above:

- Reconductor the Libby-Bonners Ferry 115 kV line (approximately 60 miles)
- Reconductor the Sandpoint-Priest River 115 kV line (approximately 17 miles)

- Upgrade the Libby-Noxon 230 kV line to 100 deg C operation
- Upgrade the Columbia Falls-Flathead 230 kV line to 100 deg C operation

Although the above line upgrades solve the thermal overload problems, unacceptable system damping still needs to be addressed. There are three ways to provide improved damping on this system.

1. Drop generation at Libby and possible Hungry Horse to reduce the excess power flow out of the area (with this solution the above line upgrades would not be required). However, voltage control and reactive margins in the area may still be a problem at peak generation.
2. Install a Flexible AC Transmission System (FACTS) device such as a Static Var Compensator (SVC) or a Static Compensator (STATCOM) that can quickly vary reactive output to aid the generator exciter system to dampen system oscillations. This solution would require the line upgrades above but would greatly improve the voltage control and reactive margins in the area as discussed in the "Reactive Analysis" above.
3. Build additional transmission from the Libby area to the Spokane area. The proposed BPA Libby-Bonners Ferry 230 kV line project (G-15) and the Sandpoint-Bell 230 kV line project (G-20) result in an additional 230 kV line from Libby to Bell (Spokane). This line should improve transient stability of the system to the extent that no new GD at Libby will be required. The addition of these projects would also reduce some of the existing GD at Libby and provide for future load growth in the Sandpoint, Idaho area. Since the proposal for projects G-15 and G-20 were developed, a number of other potential alternatives have been identified. These other alternatives have not been explored further.

3.1.2 Potential Solution Summary

Solution 1

Drop additional generation at Libby and possible Hungry Horse to stabilize the system.
Total cost: $4 Million

Solution 2

Construct an SVC or STATCOM in the Flathead Valley area to dampen system oscillations. Cost about $20 Million
Upgrade the following lines,

- Reconductor the Libby-Bonners Ferry 115 kV line (approximately 60 miles)
- Reconductor the Sandpoint-Priest River 115 kV line (approximately 17 miles)
- Upgrade the Libby-Noxon 230 kV line to 100 deg C operation
- Upgrade the Columbia Falls-Flathead 230 kV line to 100 deg C operation

Total cost: $60 Million

Solution 3

Complete the BPA G-15 and G-20 projects. This creates a new 230 kV transmission line between Libby and Bell.
Total cost: $195 Million
Note: cost includes land and overhead

Solution 4
Reduce Hungry Horse generation equal to the output of the Libby unit 6.
Total cost: Lost revenue from the reduction of Hungry Horse generation

3.2 Base conditions with seven units at Libby with equal generation reduction (240 MW) at Hungry Horse

Thermal Analysis
With seven units at Libby (840 MW) and Hungry Horse generation (104 MW) reduced equal to two units at Libby, the transmission loading with all lines in service reduces out of the Flathead Valley and increases out of the Libby area when compared to 5 units at Libby (600 MW) and Hungry Horse at 344 MW. No lines are near overloading and the heaviest loading is showing on the Libby-Noxon 230 kV line (88%).

Outage Analysis with seven units at Libby
When compared to five units at Libby and Hungry Horse generating 344 MW, the generator dropping requirements at Libby reduce about 200 MW for the following line outages: (Modified for CEII).

- Two 230 kV line outages

Generator dropping requirements increase at Libby by about 100 MW for the following outages: (Modified for CEII).

- One 115 kV line outage
- Two 230 kV line outages
- Two 230 kV bus outages
- Two double contingency 230 kV line outages

3.2.1 Potential Solution Summary
Moving 240 MW of generation from Hungry Horse to Libby results in shifting system loading from lines in the Flathead Valley area to lines serving the Libby area and can be accomplished through increased generator dropping at Libby. This will require changes to both the Flathead Valley Remedial Action Schemes (RAS) and Western Montana RAS. This could easily be accomplished within the time it takes to complete the addition of two units at Libby. The cost would be small (changes to the RAS), about $4 Million.

3.3 The following section addresses the second and third request*: "Determine the cost and feasibility of reinforcing the system so that changes in Hungry Horse generation are not required to maintain the transmission stability of the Flathead Valley." Also, "Determine the cost and feasibility of reinforcing the transmission system so that changes in Libby generation (generator dropping) are not required to maintain voltage and transmission stability in the area."*

The Libby area transmission and the Flathead Valley area transmission are not separate; the transmission for one area also supports the transmission in the other area during outages and the generation level in one area affects the transient stability performance in the other area. As such, the response to the second request (Hungry Horse Area) cannot be independent of the third request (Libby Area). In addition, Libby GD provides nearly 1000 MW of transfer capability across the WOH cutplane by reducing flow and stabilizing the grid following a 500 kV line outage to insure acceptable transient stability performance.

3.3.1 Reliability Criteria discussion

Local area

The WECC Reliability Criteria requires that all load be served for the loss of two lines on the same right of way (ROW). However, WECC allows an exception to this rule (allows load loss) if the affect of the outage is confined to the "local area". The BPA Reliability Criteria defines the Flathead Area and the Libby areas as "secondary grid" which allows the same performance as the WECC criteria exception for a "local area". What all this means is that BPA can allow either of these areas to separate from the grid (essentially a blackout to the area) and meet the WECC and BPA criteria. However, BPA has historically applied remedial action schemes ((RAS), generator dropping at Libby, minimum generation levels at Hungry Horse and direct load tripping at Columbia Falls Aluminum Co. (CFAC)) to protect the areas because these measures are viewed as low cost insurance against a local blackout. The report assumes the area will be planned for the same level of reliability as historically provided. Presently with CFAC shut down, the Flathead Valley area is vulnerable to loss of the two critical 230 kV lines because there is no generator dropping capability at Hungry Horse. Additional transmission in the area could remove the need for some or all of the RAS but the cost is high compared to continued reliance on RAS.

Main grid

The WECC reliability criteria allow dropping of generation to improve system performance and increase transfer capabilities. In order to have maximum effect, the generation must be dropped as soon as possible following the outage. Typically, generation is dropped within about 1/6 second following the outage. Ramping of generation is not an effective alternative to high speed dropping.

3.3.2 Critical Outages

Local area

The electrical performance of the Libby area and the Flathead Valley area is constrained by three distinct outages of two 230 kV lines each. These outages and their general effect are: (Modified for CEII).

1. Three double contingency 230 kV line outages

Main Grid

The critical main grid outages that presently utilize Libby GD are: (Modified for CEII)

1. Single contingency outage of any one of five, 500 kV lines
2. Double contingency outages of any one of three sets of 500 kV lines

On completion of the Grand Coulee-Bell 500 kV line project, the following facility outages will also require Libby GD: (Modified for CEI).

1. Single contingency outage of any one the following: One 230 kV bus outage, two 230 kV line outages and one 500 kV line outage.

It should be noted that although Libby is expected to be dropped for more system outages, the arming of Libby GD will occur at higher system loading and will be more closely related to the hydro generation level in the area instead of West of Hatwai flow.

3.3.3 Solutions to mitigate Libby GD for Local Area RAS and Main Grid RAS

The following will discuss in depth each of the critical outages. Solutions for each outage, or group of outages will be identified to meet the objective to eliminate generator dropping and ramping. This discussion is based on previous studies and engineering experience; no new technical studies were performed.

3.3.4 Local Area Transmission and RAS (Modified for CEII)

One double contingency 230 kV line outage
The most severe condition for this outage is when Libby and Hungry Horse are at maximum generation of 900 MW (Libby at 600 MW, Hungry Horse at 300 MW) and the area load is minimum of about 145 MW (CFAC off line). The remaining transmission consists of two 115 kV lines with a capacity of about 190 MVA which results in about 565 MW that must leave the area on new transmission

In order to eliminate the need to change Libby generation (generator dropping or ramping) for this outages, enough new transmission needs to be added so that at least two 230 kV circuits remain in service at Libby for the worst outage of two 230 kV lines connected to Libby (reliability criteria requirement). Two 230 kV lines is the minimum required transmission to operate Libby at 600 MW since each line is rated at 500 MW or less. This results in a minimum of four 230 kV lines connected to Libby.

The Libby-Bell 230 kV transmission project could be modified so that the southern portion of that project (between Sandpoint and Bell) is constructed all double circuit (would require 75 miles of double circuit construction instead of single circuit construction). The end result would be a double circuit 230 kV line from Libby to Bell. This would also require all tapped 115 kV loads on this system to convert to 230 kV operation. The existing plan assumes that one side of the 230 kV double circuit line would be operated at 115 kV to serve tapped loads along the line and would not require the entire project to be constructed double circuit.

If CFAC load were fully on, only one new 230 kV transmission line would be required because the maximum area export would be about 215 MW.

The cost for these reinforcements is:

Libby-Bell 230 kV line, 135 miles double circuit	$210 M
Two breakers at Libby and station development	$2 M
Two breakers at Bell and station development	$2 M
Conversion of 115 kV tapped loads to 230 kV	$25 M
Total cost	$264 Million

Note: Cost includes land and overhead

One double contingency 230 kV line outage

The most severe condition is when Libby is generating maximum (600 MW). The transmission solution for the previous outage would be the same for this outage. Two additional 230 kV lines are needed, Libby-Bell 230 kV double circuit line, to reliably transmit the 595 Mw from the Libby project.

3.3.5 Main Grid Transmission and RAS (Modified for CEII)

Libby generator dropping presently provides about 1000 MW of transfer capability to the existing system when the WMH is peaking. Libby GD is utilized for outages on the main grid system (500 kV). The Libby GD is only needed for some of these outages when the Western Montana Hydro (WMH) is above 500 MW and other outages when the WMH is over 1300 MW. In order to eliminate the Libby GD for main grid outages, an additional 500 kV line from Hot Springs to Noxon to Bell would be needed. Essentially, the Taft-Bell 500 kV line needs a backup line to carry power when it is out. This line would replace the existing BPA Hot Springs-Noxon-Bell 230 kV line so there is no additional land required. The plan would include a 500/230 kV transformer at Noxon because the only remaining BPA line at Noxon, the Libby-Noxon 230 kV line, requires a connection to the BPA system so the Avista system does not overload. The plan is based on previous studies but did not consider the addition of the local area transmission discussed above which could have a measurable, positive effect. The addition of the Libby-Bell 230 kV double circuit line would not be enough transmission to mitigate the need for another 500 kV east-west line from Hot Springs to Noxon to Bell.

Without Libby GD, the proposed 4200 MW West of Hatwai path rating with the new Bell-Coulee line would be reduced by at least 1000 MW without further system reinforcement. Reducing the path rating would not meet current BPA transmission obligations, which includes increased capability for Western Montana hydro. In other words, without GD, the region would not receive the full benefits for the $243 million investment in Coulee-Bell and associated projects.

There are no good alternatives to the loss of Libby GD on this path except additional transmission or replacement GD at Hungry Horse or Colstrip. This plan assumes the added transmission would mitigate the need for Libby GD for outages on this path.

The cost for this reinforcement is:

Hot Springs-Noxon-Bell 500 kV line, single circuit 164 miles	$213M
500/230 kV transformer at Noxon	$18 M
4- 500 kV terminals and station development	$12 M
Total cost:	$243 M

Note: Cost includes overhead and land

3.3.6 Solutions to mitigate Hungry Horse Separation (Modified for CEII)

One double contingency 230 kV line outage

The transmission in the Flathead Valley area is faced with many extremes of operation because it has both significant generation and load (local area load with or without CFAC load). For the purpose of this report, only the extreme condition of export is important. Also, since Hungry Horse generation is not presently dropped via a Remedial Action Scheme, this report will address what is required to prevent the separation of the area from the rest of the system with possible load rejection at Hungry Horse (blackout of the area). This affects Hungry Horse operation similarly to GD via the RAS.

Extreme export from the area occurs when the area load is minimum (140 MW) and the Hungry Horse generation is at maximum (344 MW) which results in a maximum export of about 204 MW with CFAC shut down. Area export is measured as the sum of the flow on the Libby-Conkelley and Flathead-Hot Springs 230 kV lines and the Elmo-Kerr 115 kV line. In the case with area export of 204 MW, the remaining 115 kV line from Columbia Falls to Kerr is not capable of maintaining service to the area if the two 230 kV lines are forced out. Even if the Columbia Falls-Kerr 115 kV line were reconductored to a much higher capacity, stability studies show it would not be sufficient to maintain Hungry Horse stability so it was not an option to further assess. The end result, when Hungry Horse is generating at 344 MW, is that one new 230 kV line would provide acceptable area service for the two 230 kV line outage with CFAC off line. If CFAC is at full load, no additional transmission is needed.

The new 230 kV line from the Flathead Valley was deemed to connect to Hot Springs substation because it ties to the 500 kV system which has additional capacity and is the least expensive line alternative. Studies were not performed to refine the facilities needed however a rough estimate of facility cost can be made.

The cost for these reinforcements is:

With CFAC shut down:

Columbia Falls-Hot springs 230 kV line, 70 miles	$56 M
2 breaker positions, one at Columbia Falls, one at Hot Springs	$4 M
Total cost:	$60 M

Note: Includes land and overhead

3.4 Elimination of the combined generation cap at Libby and Hungry Horse

The following section is the BPAT response to the Oct 16,2003 letter request from the US bureau of Reclamation. *Determine the cost and feasibility of removing the combined generation limit of 900 MW at Hungry Horse and Libby so the full 1025 MW generation could be utilized meet Montana State water quality standards.* Please note the combined Libby and Hungry Horse generation limit is presently 900 MW in the summer and 950 MW in the winter. The study assumed the limit will be raised to at least 944 MW in the summer due to the system reinforcements represented in 2006 (Grand Coulee-Bell Project completed). This study assessed the system requirements to raise the combined generation level from 944 MW to 1025 MW. Also, since the closing of the Columbia Falls Aluminum smelter is the primary reason for imposing the generation cap and some of the generator dropping at Libby, operation of the smelter at partial load (approximately 225 MW) would remove the generation cap and some of the RAS requirements. However, since this is not a transmission solution, it was not included in the report. The economics of subsidizing CFAC operation year around would need to be compared with the transmission solutions to determine the most cost effective remedy.

3.4.1 Thermal Analysis results

The Columbia Falls-Flathead 230 kV line overloads for an outage of the following facilities: (Modified for CEII)

- Four 230 kV line outages and one 230/500 kV transformer outage. or
- Four double contingency 230 kV line, or
- Two 230 kV bus outages, or
- Two Avista 230 kV line if Avista does not drop generation at Noxon.

The Columbia Falls-Flathead 230 kV line would need to be upgraded to 100 Deg. C operation or additional GD is required at Libby and / or Hungry Horse.

The Columbia Falls-Kalispell-Kerr 115 kV line overloads for an outage of the following facilities: (Modified for CEII)

Two 230 kV line outages, or
One 230 kV bus outage

The Columbia Falls-Kalispell-Kerr 115 kV line would need to be reconductored or additional GD is required at Libby and / or Hungry Horse. Please note that the reconductoring of this line is only one of several line upgrades required to allow higher Libby generation.

The Sand Creek-Laclede-Priest River 115 kV line overloads for an outage of the following facilities:

One Avista 230 kV line if Avista does not drop generation at Noxon.

The Sand Creek-Laclede-Priest River 115 kV line would need to be reconductored or additional GD is required at Libby and / or Hungry Horse.

3.4.2 Transient Stability Analysis Results

The following outages in the Flathead Valley area cause undamped oscillations in hydro generators, including Libby and Hungry Horse, in the western Montana area:

Two 230 kV line outages, or
One 230 kV bus outage

GD at Hungry Horse (this could be added to the existing Flathead Valley remedial Action Scheme) or additional 230 kV transmission between Columbia Falls and either Bell or Hot Springs would eliminate the undamped oscillations. An alternate means of damping the system oscillations would be to install an SVC or STATCOM in the Flathead Valley.

The following outages in the Bell area cause undamped oscillations in hydro generators in the western Montana area:

Nine 230 kV line outages, or
Two transformer outages, or
Four Avista 230 kV line outages

Additional 230 kV transmission between Columbia Falls and either Bell or Hot Springs would eliminate the undamped oscillations or include all of the outages noted above in the Western Montana Remedial Action Scheme which would drop additional Libby and Hungry Horse generation. However, it may not be practical to add this large number of additional outages to the scheme because of the limitations of the RAS hardware. An alternate means of damping the system oscillations would be to install a 150 MVAR SVC or STATCOM in the Flathead Valley.

3.4.3 Potential Solution Summary

The technical studies show one of three solutions is required to solve both the thermal overload and the undamped oscillation problem to eliminate the operational generation cap at Libby and Hungry Horse. The three solutions are:

Solution 1:

Drop Hungry Horse generation for outages of about 20 new facilities (may be beyond capability of new RAS controller)
Insure that Noxon generation is dropped for Avista 230 kV line outages (cost and feasibility is unknown due to foreign utility).
Total cost $10 M plus unknown Avista cost.

Solution 2:

Upgrade the following lines:

- Upgrade the Columbia Falls-Flathead 230 kV line to 100 Deg. C operation
- Reconductor the Columbia Falls-Kalispell-Kerr 115 kV line
- Reconductor the Sand Creek-Laclede-Priest River 115 kV line

Install a 150 MVAR SVC or STATCOM in the Flathead Valley Area
Total cost $35 Million

Solution 3:

Construct about 200 miles of new 230 kV transmission line from Columbia Falls to Hot Springs and from Libby to Bell.
Total cost about $150 M.

4.0 Solution Summary Table

Table 1. Summary of Transmission Solutions for Generation Changes at Libby and Hungry Horse

	Solution	Study Request				
		A	B	C	D	E
		A Operate with 6 units at Libby, no reduction at HH	Operate with 7 units at Libby with HH reduced	Eliminate gen dropping at Libby	Eliminate separation at Hungry Horse	Increase max gen cap at Libby and HH
Solution 1**	Drop additional generation at Libby and Possibly Hungry Horse	x	x			
	Cost $4 Million					
Solution 2	Install a 150 MVAR SVC or STATCOM at Columbia Falls and upgrade lines	x				
	Cost $60 Million					
Solution 3	Build G-15 and G20 projects, Libby-Bell 230 kV line	x				
	Cost $195 Million					
Solution 4	Reduce HH generation by about 120 MW (max gen about 200 MW)	x				
	Cost Lost generation at HH					
Solution 5	Build Libby-Bell double circuit 230 kV line and Hot Springs-Noxon-Bell 500 kV line and associated facilities			x		
	Cost $507 Million					
Solution 6	Build Columbia Falls-Hot Springs No 2 230 kV line and Hot Springs-Noxon-Bell 500 kV line and associated facilities				x	
	Cost $303 Million					
Solution 7	Drop HH generation for about 20 new outages, (RAS additions)					x
	Cost $10 Million					
Solution 8	Install a 150 MVAR SVC or STATCOM at Columbia Falls and upgrade lines					x
	Cost $35 Million					
Solution 9	Construct Columbia Falls-Hot Springs and Libby-Bell single circuit 230 kv lines.					x
	Cost $150 Million					
Notes:						
1. HH = Hungry Horse						
2. For each request, any of the solutions in that column can meet the need. For example, to operate with six units at Libby, either solution 1, 2, 3, or 4 will						
3. Solutions 2 and 8 use the same SVC or STATCOM. However, the line upgrades are different.						
4. See report for full details						
** This solution may be subject to higher than normal transmission curtailments and voltage regulation problems in operation						

5.0 Transmission Access

This section applies to all four areas of concern addressed in this report. The last concern, removing the combined 900 MW generation limit, is used as an example.

TBL plans the grid to meet transmission obligations in accordance with its Open Access Transmission Tariff (OATT). Based on the recently completed public process on Available Transfer Capability (ATC), BPA's Power Business Line has reserved 900 MW of transmission capacity across the West of Hatwai (WOH) cutplane. Any changes to the 900 MW reservation must be requested by the BPA Power Business Line in accordance with the OATT and the procedures outlined in the ATC posting.

The Grand Coulee-Bell 500 kV Transmission Project will add significant capacity across the WOH cutplane but that capacity will be consumed by the excess Federal generation that was stranded east of the WOH cutplane when the smelters at Columbia Falls and Spokane were closed (about 800 MW) plus any additional allocation to Avista for their project investment. If there is available capacity after the Project is completed, that capacity will be made available for existing transmission requests that are still pending. It is likely that new transmission will be necessary to fully service the pending requests. Also, a PBL request for an additional 135 MW from Libby and Hungry Horse will require fresh studies that are based on the system and conditions that exist when the transmission request reaches the top of the transmission queue. Therefore, the study results reported herein are at best an estimate to service a 135 MW request if it was at the top of the transmission queue today. Realistically, TBL could not service a request for 135 MW, considering the many requests pending, until roughly the 2010 time period.

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